```
################################################################################

Please log in with your NetID in lowercase letters (e.g. abc123 not ABC123)

################################################################################
nkp030@129.105.248.25's password:
Last login: Wed Feb  8 20:55:10 2023 from pa-dhcp-10-120-224-166.gp-vpn.northwestern.private
[nkp030@spselastic10 ~]$ psql -h 129.105.248.26  -U nkp030 -d postgres;
psql (10.14, server 10.15)
Type "help" for help.

postgres=> \c saleco_dw;
psql (10.14, server 10.15)
You are now connected to database "saleco_dw" as user "nkp030".
saleco_dw=> \dt;
              List of relations
 Schema |        Name         | Type  |  Owner
--------+---------------------+-------+----------
 public | dwcustomer          | table | ajb254
 public | dwdaysalesfact      | table | ajb254
 public | dwproduct           | table | ajb254
 public | dwregion            | table | ajb254
 public | dwtime              | table | ajb254
 public | dwvendor            | table | ajb254
 public | kscustomer          | table | postgres
 public | ksdaysales_cus_reg  | table | postgres
(8 rows)

saleco_dw=> \d dwcustomer;
                    Table "public.dwcustomer"
   Column    |         Type          | Collation | Nullable | Default
-------------+-----------------------+-----------+----------+---------
 cus_code    | integer               |           | not null |
 cus_lname   | character varying(15) |           |          |
 cus_fname   | character varying(15) |           |          |
 cus_initial | character(1)          |           |          |
 cus_state   | character(2)          |           |          |
 reg_id      | integer               |           |          |
Indexes:
    "dwcustomer_pkey" PRIMARY KEY, btree (cus_code)
Foreign-key constraints:
    "dwcustomer_reg_id_fkey" FOREIGN KEY (reg_id) REFERENCES dwregion(reg_id)

saleco_dw=> \d dwdaysalesfact;
                   Table "public.dwdaysalesfact"
   Column   |         Type          | Collation | Nullable | Default
------------+-----------------------+-----------+----------+---------
 tm_id      | integer               |           | not null |
 cus_code   | integer               |           | not null |
 p_code     | character varying(10) |           | not null |
 sale_units | integer               |           |          |
 sale_price | numeric(10,2)         |           |          |
Indexes:
    "dwdaysalesfact_pkey" PRIMARY KEY, btree (tm_id, cus_code, p_code)

saleco_dw=> \d dwproduct;
                    Table "public.dwproduct"
   Column   |         Type          | Collation | Nullable | Default
------------+-----------------------+-----------+----------+---------
 p_code     | character varying(10) |           | not null |
 p_descript | character varying(35) |           |          |
 p_category | character varying(5)  |           |          |
 v_code     | integer               |           |          |
Indexes:
    "dwproduct_pkey" PRIMARY KEY, btree (p_code)
Foreign-key constraints:
    "dwproduct_v_code_fkey" FOREIGN KEY (v_code) REFERENCES dwvendor(v_code)

saleco_dw=> \d dwregion;
                    Table "public.dwregion"
  Column  |         Type          | Collation | Nullable | Default
----------+-----------------------+-----------+----------+---------
 reg_id   | integer               |           | not null |
 reg_name | character varying(10) |           |          |
Indexes:
    "dwregion_pkey" PRIMARY KEY, btree (reg_id)
Referenced by:
    TABLE "dwcustomer" CONSTRAINT "dwcustomer_reg_id_fkey" FOREIGN KEY (reg_id) REFERENCES dwregion(reg_id)

saleco_dw=> \d dwtime;
                Table "public.dwtime"
  Column  |  Type   | Collation | Nullable | Default
----------+---------+-----------+----------+---------
 tm_id    | integer |           | not null |
 tm_year  | integer |           |          |
 tm_month | integer |           |          |
 tm_day   | integer |           |          |
 tm_qtr   | integer |           |          |
Indexes:
    "dwtime_pkey" PRIMARY KEY, btree (tm_id)

saleco_dw=> \d dwvendor;
                     Table "public.dwvendor"
   Column   |         Type          | Collation | Nullable | Default
------------+-----------------------+-----------+----------+---------
 v_code     | integer               |           | not null |
 v_name     | character varying(35) |           |          |
 v_areacode | character(3)          |           |          |
 v_state    | character(2)          |           |          |
Indexes:
    "dwvendor_pkey" PRIMARY KEY, btree (v_code)
```

```
Referenced by:
    TABLE "dwproduct" CONSTRAINT "dwproduct_v_code_fkey" FOREIGN KEY (v_code) REFERENCES dwvendor(v_code)

saleco_dw=> SELECT reg_name as region, c.cus_code as customer, SUM(sale_units * sale_price) as total_sales
saleco_dw-> FROM dwdaysalesfact s
saleco_dw-> LEFT JOIN dwcustomer c
saleco_dw-> ON s.cus_code = c.cus_code
saleco_dw-> LEFT JOIN dwregion r
saleco_dw-> ON c.reg_id = r.reg_id
saleco_dw-> GROUP BY 1, 2
saleco_dw-> ORDER BY 1, 2;
 region | customer | total_sales
--------+----------+-------------
 NE     |    10012 |      287.91
 NE     |    10013 |       64.32
 NW     |    10014 |      494.71
 NW     |    10019 |       39.95
 SE     |    10010 |      180.26
 SE     |    10011 |      130.89
 SE     |    10015 |      325.82
 SE     |    10016 |      179.22
 SW     |    10017 |      419.66
 SW     |    10018 |      129.32
(10 rows)

saleco_dw=> SELECT reg_name as region, c.cus_code as customer, SUM(sale_units * sale_price) as total_sales
saleco_dw-> FROM dwdaysalesfact s
saleco_dw-> LEFT JOIN dwcustomer c
saleco_dw-> ON s.cus_code = c.cus_code
saleco_dw-> LEFT JOIN dwregion r
saleco_dw-> ON c.reg_id = r.reg_id
saleco_dw-> GROUP BY ROLLUP(1, 2)
saleco_dw-> ORDER BY 1, 2;
 region | customer | total_sales
--------+----------+-------------
 NE     |    10012 |      287.91
 NE     |    10013 |       64.32
 NE     |          |      352.23
 NW     |    10014 |      494.71
 NW     |    10019 |       39.95
 NW     |          |      534.66
 SE     |    10010 |      180.26
 SE     |    10011 |      130.89
 SE     |    10015 |      325.82
 SE     |    10016 |      179.22
 SE     |          |      816.19
 SW     |    10017 |      419.66
 SW     |    10018 |      129.32
 SW     |          |      548.98
        |          |     2252.06
(15 rows)

saleco_dw=>
saleco_dw=> SELECT reg_name as region, c.cus_code as customer, SUM(sale_units * sale_price) as total_sales
saleco_dw-> FROM dwdaysalesfact s
saleco_dw-> LEFT JOIN dwcustomer c
saleco_dw-> ON s.cus_code = c.cus_code
saleco_dw-> LEFT JOIN dwregion r
saleco_dw-> ON c.reg_id = r.reg_id
saleco_dw-> GROUP BY CUBE(1, 2)
saleco_dw-> ORDER BY 1, 2;
 region | customer | total_sales
--------+----------+-------------
 NE     |    10012 |      287.91
 NE     |    10013 |       64.32
 NE     |          |      352.23
 NW     |    10014 |      494.71
 NW     |    10019 |       39.95
 NW     |          |      534.66
 SE     |    10010 |      180.26
 SE     |    10011 |      130.89
 SE     |    10015 |      325.82
 SE     |    10016 |      179.22
 SE     |          |      816.19
 SW     |    10017 |      419.66
 SW     |    10018 |      129.32
 SW     |          |      548.98
        |    10010 |      180.26
        |    10011 |      130.89
        |    10012 |      287.91
        |    10013 |       64.32
        |    10014 |      494.71
        |    10015 |      325.82
        |    10016 |      179.22
        |    10017 |      419.66
        |    10018 |      129.32
        |    10019 |       39.95
        |          |     2252.06
(25 rows)

saleco_dw=> SELECT c.cus_code, tm_month, p_code, SUM(sale_units * sale_price) as total_sales
saleco_dw-> FROM dwdaysalesfact s
saleco_dw-> LEFT JOIN dwcustomer c
saleco_dw-> ON s.cus_code = c.cus_code
saleco_dw-> LEFT JOIN dwtime t
saleco_dw-> ON s.tm_id = t.tm_id
saleco_dw-> GROUP BY 1, 2, 3
saleco_dw-> ORDER BY 1, 2;
 cus_code | tm_month |  p_code  | total_sales
----------+----------+----------+-------------
    10010 |       10 | 13-Q2/P2 |       74.95
```

Question 4: When using the rollup function on top of the group by function, you get a subtotal for the columns that are included in the group by. For example in question 2, we get a subtotal for each part of the group by in hierarchical order. This shows up in the answer as a subtotal for region & customer, region, and total. On the other hand, the cube function gives a subtotal for every combination of the fields in the group by, not maintain hierarchical order. This is seen in question 3 where we get a sub total for region & customer, region, customer, and total. The additional value from both of these is the opportunity to see a variety of subtotals without the need for another query.

```
    10010 |       10 | 23109-HB |       19.90
    10010 |       10 | 54778-2T |       14.97
    10010 |       10 | PVC23DRT |       70.44
    10011 |       10 | 2232/QTY |      109.92
    10011 |       10 | SM-18277 |       20.97
    10012 |        9 | SM-18277 |       20.97
    10012 |       10 | 23109-HB |        9.95
    10012 |       10 | 89-WRE-Q |      256.99
    10013 |       10 | 13-Q2/P2 |       29.98
    10013 |       10 | 54778-2T |        4.99
    10013 |       10 | PVC23DRT |       29.35
    10014 |        9 | 13-Q2/P2 |       14.99
    10014 |        9 | 2232/QTY |      109.92
    10014 |        9 | 23109-HB |        9.95
    10014 |       10 | WR3/TT3  |      359.85
    10015 |        9 | 2238/QPD |       38.95
    10015 |        9 | 23109-HB |        9.95
    10015 |        9 | 54778-2T |        9.98
    10015 |        9 | 89-WRE-Q |      256.99
    10015 |       10 | 23109-HB |        9.95
    10016 |        9 | 13-Q2/P2 |      104.93
    10016 |        9 | 1546-QQ2 |       39.95
    10016 |        9 | 54778-2T |        4.99
    10016 |        9 | PVC23DRT |       29.35
    10017 |        9 | 13-Q2/P2 |       14.99
    10017 |        9 | 23109-HB |       29.85
    10017 |        9 | 54778-2T |       14.97
    10017 |        9 | WR3/TT3  |      359.85
    10018 |        9 | 2238/QPD |       38.95
    10018 |        9 | 23109-HB |        9.95
    10018 |        9 | 54778-2T |        9.98
    10018 |        9 | PVC23DRT |       70.44
    10019 |        9 | 1546-QQ2 |       39.95
(34 rows)

saleco_dw=> SELECT c.cus_code, cus_fname, cus_lname, SUM(sale_units * sale_price) as total_sales
saleco_dw-> FROM dwdaysalesfact s
saleco_dw-> LEFT JOIN dwcustomer c
saleco_dw-> ON s.cus_code = c.cus_code
saleco_dw-> LEFT JOIN dwtime t
saleco_dw-> ON s.tm_id = t.tm_id
saleco_dw-> WHERE tm_month = 9
saleco_dw-> GROUP BY 1, 2, 3
saleco_dw-> ORDER BY  4 desc;
 cus_code | cus_fname | cus_lname | total_sales
----------+-----------+-----------+-------------
    10017 | George    | Williams  |      419.66
    10015 | Amy       | O'Brian   |      315.87
    10016 | James     | Brown     |      179.22
    10014 | Myron     | Orlando   |      134.86
    10018 | Anne      | Farriss   |      129.32
    10019 | Olette    | Smith     |       39.95
    10012 | Kathy     | Smith     |       20.97
(7 rows)

saleco_dw=> SELECT tm_month, p_category, SUM(sale_units * sale_price) as total_sales
saleco_dw-> FROM dwdaysalesfact s
saleco_dw-> LEFT JOIN dwtime t
saleco_dw-> ON s.tm_id = t.tm_id
saleco_dw-> LEFT JOIN dwproduct p
saleco_dw-> ON s.p_code = p.p_code
saleco_dw-> GROUP BY 1, 2
saleco_dw-> ORDER BY 1, 2;
 tm_month | p_category | total_sales
----------+------------+-------------
        9 | CAT1       |      174.83
        9 | CAT2       |      446.81
        9 | CAT3       |      537.54
        9 | CAT4       |       80.67
       10 | CAT1       |      124.89
       10 | CAT2       |      366.91
       10 | CAT3       |      459.64
       10 | CAT4       |       60.77
(8 rows)

saleco_dw=> SELECT tm_month, COUNT(*) as product_sales, SUM(sale_units * sale_price) as total_sales
saleco_dw-> FROM dwdaysalesfact s
saleco_dw-> LEFT JOIN dwtime t
saleco_dw-> ON s.tm_id = t.tm_id
saleco_dw-> GROUP BY 1
saleco_dw-> ORDER BY 1;
 tm_month | product_sales | total_sales
----------+---------------+-------------
        9 |            23 |     1239.85
       10 |            13 |     1012.21
(2 rows)

saleco_dw=> SELECT tm_month, p_category, p.p_code, p_descript, sum(sale_units) as units_sold
saleco_dw-> FROM dwdaysalesfact s
saleco_dw-> LEFT JOIN dwtime t
saleco_dw-> ON s.tm_id = t.tm_id
saleco_dw-> LEFT JOIN dwproduct p
saleco_dw-> ON s.p_code = p.p_code
saleco_dw-> WHERE p.p_code IN
saleco_dw-> (SELECT p_code FROM dwdaysalesfact GROUP BY 1 ORDER BY sum(sale_units) desc LIMIT 1)
saleco_dw-> GROUP BY 1, 2, 3, 4;
 tm_month | p_category |  p_code  |       p_descript        | units_sold
----------+------------+----------+-------------------------+------------
        9 | CAT3       | PVC23DRT | PVC pipe, 3.5-in., 8-ft |         17
       10 | CAT3       | PVC23DRT | PVC pipe, 3.5-in., 8-ft |         17
(2 rows)
```

```
saleco_dw=> SELECT tm_month, p_category, p.p_code, p_descript, COUNT(*) as product_sales, SUM(sale_units * sale_price) as total_sales
saleco_dw-> FROM dwdaysalesfact s
saleco_dw-> LEFT JOIN dwtime t
saleco_dw-> ON s.tm_id = t.tm_id
saleco_dw-> LEFT JOIN dwproduct p
saleco_dw-> ON s.p_code = p.p_code
saleco_dw-> GROUP BY 1, 2, 3, 4
saleco_dw-> ORDER BY 1, 2, 3, 4;
 tm_month | p_category |  p_code  |             p_descript              | product_sales | total_sales
----------+------------+----------+-------------------------------------+---------------+-------------
        9 | CAT1       | 13-Q2/P2 | 7.25-in. pwr. saw blade             |             4 |      134.91
        9 | CAT1       | 54778-2T | Rat-tail file, 1/8-in. fine         |             4 |       39.92
        9 | CAT2       | 1546-QQ2 | Hrd. cloth, 1/4-in., 2x50           |             2 |       79.90
        9 | CAT2       | 2232/QTY | B\&D jigsaw, 12-in. blade           |             1 |      109.92
        9 | CAT2       | 89-WRE-Q | Hicut chain saw, 16 in.             |             1 |      256.99
        9 | CAT3       | 2238/QPD | B\&D cordless drill, 1/2-in.        |             2 |       77.90
        9 | CAT3       | PVC23DRT | PVC pipe, 3.5-in., 8-ft             |             2 |       99.79
        9 | CAT3       | WR3/TT3  | Steel matting, 4'x8'x1/6", .5" mesh |             1 |      359.85
        9 | CAT4       | 23109-HB | Claw hammer                         |             5 |       59.70
        9 | CAT4       | SM-18277 | 1.25-in. metal screw, 25            |             1 |       20.97
       10 | CAT1       | 13-Q2/P2 | 7.25-in. pwr. saw blade             |             2 |      104.93
       10 | CAT1       | 54778-2T | Rat-tail file, 1/8-in. fine         |             2 |       19.96
       10 | CAT2       | 2232/QTY | B\&D jigsaw, 12-in. blade           |             1 |      109.92
       10 | CAT2       | 89-WRE-Q | Hicut chain saw, 16 in.             |             1 |      256.99
       10 | CAT3       | PVC23DRT | PVC pipe, 3.5-in., 8-ft             |             2 |       99.79
       10 | CAT3       | WR3/TT3  | Steel matting, 4'x8'x1/6", .5" mesh |             1 |      359.85
       10 | CAT4       | 23109-HB | Claw hammer                         |             3 |       39.80
       10 | CAT4       | SM-18277 | 1.25-in. metal screw, 25            |             1 |       20.97
(18 rows)

saleco_dw=>
```